DOCUMENT RESUME

ED 036 861 24 CG 005 160

AUTHOR	Allen, R.R.; Rott, Robert K.
TITLE	The Nature of Critical Thinking. Report from the Concepts in Verbal Argument Project. Theoretical Paper No. 20.
INSTITUTION	Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-5-0216
PUB DATE	May 69
CONTRACT	OEC-5-10-154
NOTE	25p.
EDRS PRICE	EDRS Price MF-$0.25 HC-$1.35
DESCRIPTORS	Cognitive Processes, *Concept Formation, *Critical Thinking, *Definitions, *Evaluative Thinking, *Learning Processes, Problem Solving

ABSTRACT

Although critical thinking is a pervasive educational objective, it remains inconsistently and imperfectly defined. The present paper attempts to sort out direct attempts at defining critical thinking. Such definitions are classified as representing one of three differing points of view: critical thinking as evaluation, critical thinking as problem solving, and critical thinking as a pluralistic act. (Author)

BR 5-0216
PA-24
CG

THEORETICAL PAPER NO. 20

THE NATURE OF CRITICAL THINKING

REPORT FROM THE CONCEPTS IN VERBAL ARGUMENT PROJECT

ED036861

WISCONSIN RESEARCH AND DEVELOPMENT

CENTER FOR COGNITIVE LEARNING

THE UNIVERSITY OF WISCONSIN
Madison, Wisconsin

U. S. Office of Education
Center No. C-03
Contract OE 5-10-154

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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ED036861

Theoretical Paper No. 20

THE NATURE OF CRITICAL THINKING

By R. R. Allen and Robert K. Rott

Report from the Concepts in Verbal Argument Project
R. R. Allen, Principal Investigator

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

May 1969

CG 005160

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.

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The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Theoretical Paper is from the Concepts in Verbal Argument Project in Program 2. General objectives of the Program are to establish rationale and strategy for developing instructional systems, to identify sequences of concepts and cognitive skills, to develop assessment procedures for those concepts and skills, to identify or develop instructional materials associated with the concepts and cognitive skills, and to generate new knowledge about instructional procedures. Contributing to these Program objectives, the staff of the project developed a semiprogrammed course in verbal argument and related tests for use at the high school level. The project staff prepared the materials on the basis of an outline of concepts and critical skills developed from an evaluation of everyday discourse.

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Abstract

Although critical thinking is a pervasive educational objective, it remains inconsistently and imperfectly defined. The present paper attempts to sort out direct attempts at defining critical thinking. Such definitions are classified as representing one of three differing points of view: critical thinking as evaluation, critical thinking as problem solving, and critical thinking as a pluralistic act. In addition to reviewing direct attempts at definition, this paper presents selected lists of behavioral objectives which were formulated by major study groups seeking to set forth the precise skills which cluster under the critical thinking rubric. The paper concludes by arguing that the evaluative view of critical thinking offers the greatest promise for implementation and that standards for evaluation should be measured against the critical thinking demands of the field of ordinary discourse.

I

Introduction

It is difficult to find a serious statement of educational objectives that does not pay explicit or implicit tribute to critical thinking abilities. In a similar fashion, one is hard pressed to find a teacher of social studies, English, speech, science, or mathematics who does not claim improvement in critical thinking as a positive outcome of his course. That development of critical thinking skills is a pervasive and important educational objective was recognized by the Educational Policies Commission of the National Education Association:

> The purpose which runs through and strengthens all other educational purposes—the common thread of education—is the development of the ability to think. This is a central purpose to which the school must be oriented if it is to accomplish either its traditional tasks or those newly accentuated by recent changes in the world....Many agencies contribute to achieving educational objectives, but this particular objective will not be generally attained unless the school focuses on it. In this context, therefore, the development of every student's rational powers must be recognized as centrally important.[1]

Other individuals and groups have been equally forceful in attributing great importance to critical thinking as an educational objective. The particular arguments which they advance are diverse. Critical thinking has been viewed as important both to individuals attempting to cope with the problems of daily living and to a democratic society attempting to resolve difficult and complex social issues.

From the individual's point of view, critical thinking has been viewed as important in itself, but even more, it has been considered central to other educational goals such as independence of judgment and self-direction. From a societal point of view, critical thinking has been viewed as essential to the democratic process. Some have noted that, since enlightened consensus is the basis of a democratic society, critical thinking together with necessary dialogue assumes paramount importance. Others have given even greater urgency to this objective by suggesting that the quality of our communal thinking will determine our very survival as a free people.

Although the exponents of critical thinking may at times be guilty of mild overstatement, few would question that critical thinking is an important educational objective whether viewed from an individual or a societal point of view.

Although the improvement of student critical-thinking abilities has received general and specific recognition as a worthy educational goal, few study groups and few teachers have been able to define well, even in a general way, what it means to think critically. Wallen et al. have noted that although critical thinking appears to be a universally accepted objective of education "we are frequently unclear as to what we mean by it and to what extent we wish to live with its consequences."[2] Given this lack of precise definition, it is not surprising to learn that direct instruction in critical thinking is usually absent from the schools. Dressel has noted that teachers' concern for reasoning ability "contrasts severely with the paucity of opportunity for exercise of such ability in many classrooms."[3] The process of translating critical thinking objectives into specific areas of content that may be taught to students remains largely unaccomplished.

It would seem important therefore that efforts be directed toward narrowing the gap between critical thinking as an educational objective and critical thinking as an instructional reality.

It is the purpose of this paper to sort out and classify selected definitions of critical thinking, to review lists of behavioral objectives related to critical thinking, and to present conclusions based on the foregoing discussion.

II

Critical Thinking Defined

As the previous section noted, the concept critical thinking is ill defined. To the layman, the term takes on vague meanings ranging from carping criticism to quiet contemplation. Although the concept is popularly regarded as a familiar one, it is an ambiguous rather than a clear-cut concept. Having surveyed, thought, and interacted regarding the meaning of the term, the staff of the Illinois Project on Critical Thinking concluded:

> But under close examination, it became clear to us that it is a vague and ambiguous notion. We found, for example, that many people tend to identify critical thinking with so-called propaganda analysis, or to associate it with wholesale skepticism or even with juvenile negativism of the rebellious adolescent.[4]

Although the meanings of the concept become somewhat more precise as one moves from the world of the town to the world of the gown, many educators are also hard pressed to provide clear-cut definitions of the term. To many teachers, critical thinking means "sound" thinking, or "logical" thinking, or "careful" thinking and very little more. Even the highly motivated teacher in search of more precise meanings is hard pressed to find them. Our journals reflect a lack of consistency in very basic terminology. Different terms are used to describe the same thing, and like terms are used to describe different things. Having encountered the literature of reflective thinking, associative thinking, problem solving, creative thinking, and critical thinking, most teachers are content to return to their classrooms to ponder gerunds and participles or the Civil War and westward expansion.

In this section, an effort will be made to set forth three prominent views of critical thinking.

Critical Thinking as an Act of Evaluation

One of the major views of critical thinking portrays it as an act of evaluation or judgment. Illustrative of this stance is the definition of critical thinking provided by David H. Russell in the ***Encyclopedia of Educational Research***.

> Critical thinking . . . is a process of evaluation or categorization in terms of some previously accepted standards. It is a logical examination of data which avoids fallacies and judgments on an emotional basis only.[5]

On the strength of such a definition, some would contrast critical thinking with such other higher mental processes as problem solving or creative thinking. For example, Russell explained:

> When a teacher asks, "Is this a good story?" or "Do you accept the scientific claim in this advertisement?" he is not posing a problem, as discussed above, nor is he calling for a new production as in creative thinking. Essentially he is asking, "What is your judgment?" This is a special kind of problem with restricted answers, such as ***yes*** or ***no*** or ***doubtful*** to the science question or ***funny*** or ***exciting*** or ***realistic*** as responses to the story.[6]

When viewed in this way, critical thinking differs from problem solving and creative thinking in that it begins with a previous claim, conclusion, or product and considers the question, "Of what truth or worth is it?" On the other hand, both problem solving and creative thinking begin with a perceived problem or task and explore the question, "How might this difficulty be resolved?"

Given that critical thinking has to do with evaluation, one may next ask, "What is it that is to be judged?" B. Othanel Smith, Director of the Illinois Project, provided a basic answer when he wrote, "Now if we set about to find out what . . . a statement means and to determine whether to accept or reject it, we would be engaged in thinking which, for lack of a better term, we shall call critical thinking."[7] It is this statement that Ennis, Director of the Cornell Project on Critical Thinking, credited as the basis for his "root notion of critical thinking as the correct assessment of statements."[8]

If critical thinking has to do with the correct assessment of statements, it would next seem appropriate to consider the nature of statements and the nature of correct assessment. A statement may be defined as a sentence which presents an assertion. Since a statement has assertive content, it makes sense to respond to such a sentence by replying "I agree" or "I disagree." The importance of this distinction may be made clear by comparing a statement with other types of sentences. For example, the sentences "Fred Twombly is a teacher," "Adolf Hitler was a bad man," and "The sun is 93,000,000 miles from the earth" are clearly statements since it makes sense to respond to them by saying "I agree" or "I disagree." On the other hand, sentences such as "How are you today?", "I promise to go," and "Shut your mouth" are clearly not statements since it does not make much sense to reply to them by saying "I agree" or "I disagree." Questions, promises, commands, and numerous other speech acts are thus nonstatements.

What are statements about? Statements present assertions about a multitude of subjects. For example, one might assert "Smoking causes heart disease," "Capital punishment is morally unethical," "Harry Truman was America's greatest President," "Gleem contains GL-70," "Modern art is rubbish," or even "We should go to a movie tonight." The diversity of these topics suggests the complexity of the question, "What is it to assess a statement correctly?"

Russell's definition, with which this section began, noted that critical thinking involves the "process of evaluation . . . in terms of some previously accepted standards." What are the standards for correct assessment? Most of those who subscribe to Russell's view of critical thinking draw their standards of correct assessment from the traditional rules of logic. For example, Hyram has noted "that thinking is critical when it is essentially logical" and "that logical thinking is no more than the application of the rules of logic to factual data in order to arrive at valid as well as true conclusions."[9] Consistent with this point of view is the centrality of logic attributed by Ennis to the development of student critical thinking skills.[10] Also consistent with this viewpoint is Gotesky's definition of critical thinking, i.e., "thinking governed by certain well established logical rules."[11]

Given this point of departure, critical thinking is most often viewed as consisting of the identification of sentences with assertive content and the testing of these statements and their justifications against standards of correct assessment abstracted from traditional logics.

Critical Thinking as an Act of Inquiry

The second major approach considers critical thinking an act of inquiry. Illustrative of this posture is the explication of critical thinking offered by Karl O. Budmen in the ***Peabody Journal of Education***:

> Our students need to be taught and can be taught that there are problems for which there is no single solution—only judgments and choices of alternatives. What to consider in arriving at those judgments, how to identify the alternatives and make the choices, is what the process of critical thinking is all about.
>
> The heart of the process as well as its initial step rests in the identification of basic assumptions, feelings, beliefs, and values. . . .
>
> The second step involves an examination of all sides of the issue. Our Aristotelian conditioning still plays verbal tricks on us when we mentally dichotomize problems on a ***both*** sides rather than an ***all*** sides basis. . . .
>
> The third step demands an examination of all possible actions and their probable results. More than anything else, students must understand that ***all behavior has consequences***. . . .
>
> Lastly, the process requires a decision, a choice of alternatives. Given

> a problem, having identified the point of view, having examined the issue, the alternative possibilities and their consequences, the student should be able to select *his* solution. . . .
>
> In any case, the kind of problem best suited to the critical thinking process doesn't allow of a *right* answer.[12]

When viewed in this way, critical thinking, reflective thinking, and problem solving are virtually synonymous terms.

Although the particular steps in the process may differ from one author or study group to the next, the process is usually taken to include the recognition of a problem, the examination of all aspects of the problem, identification of alternative courses of action, identification of the consequences of alternative courses of action, and decision-making (selecting the best solution). One variation on these categories was suggested by Goldmark who observed:

> The equating of critical thinking with the steps of problem solving, or of the scientific method, limits the process to: identifying the problem, gathering and organizing data, analyzing data, formulating a hypothesis, testing the hypothesis, drawing a conclusion, generalizing, and, finally, testing the conclusion.[13]

The particular labels assigned to the stages of the process are influenced by the discipline in which the inquiry process is to be used. For example, in the sciences the labels of the steps of inquiry are drawn from models describing the scientific method. In the social studies, on the other hand, the stages of inquiry are labeled by terms abstracted from problem-solving models.

To this point, two basic views of critical thinking have been explicated—critical thinking as an act of evaluation and critical thinking as an act of inquiry. One may, of course, question whether the distinction between these points of view is trivial or significant.

At first glance, the difference between the two views may appear to be only temporal. Critical thinking as evaluation starts with a conclusion and works its way back to the data from which the conclusion was constructed. Critical thinking as inquiry begins with data and works its way forward to a conclusion. If this were the only distinction, it would indeed be a small matter.

However, the difference between these two perspectives involves more than a temporal sequence. Perhaps the important distinction between the two views may be understood by considering how one would evaluate a person engaging in each of the two acts—the act of inquiry and the act of evaluation. If one were to evaluate a student engaged in the act of inquiry, one would assess the closeness of fit of the student's behavior against a model of the inquiry process. Thus one would question whether the student demonstrates awareness of a problem, gathers appropriate data, formulates tentative conclusions, examines the consequences of such conclusions, etc. On the other hand, if one were tc evaluate a student engaged in the act of evaluation, one would question whether the student employed proper tests in evaluating the specific statistics, examples, and testimony which he had acquired. One would also question whether the student adequately evaluated arguments he encountered against proper logical standards. One might also question whether the particular claims which the student advances are sufficient given the customary rules of logical utterances. When viewed in this way, critical thinking as inquiry involves a work strategy predictive of sound decision-making, whereas critical thinking as evaluation involves the proper assessment of information and arguments against logical or quasi-logical norms at whatever stage of the inquiry process they may occur.

Critical Thinking as a Pluralistic Act

In addition to the two major views of critical thinking identified above, there is a third view which may be taken as a synthesis of the earlier views. The basis for such a synthesis was noted by Kurfman when he wrote:

> Throughout the educational literature from Dewey to Bruner, two aspects of effective thinking are identifiable, ***a creative component and a critical component***. The creative aspect includes curiosity and hypothesis formation. It is the stage where inquiry and ideas originate. The critical aspect includes the rigorous analysis of questions and ideas. It is the stage where questions are clarified and ideas are tested. In effective thinking the two aspects interact continuously, but for

> the purpose of describing teacher and student behaviors the creative—critical distinction is useful.[14]

Although this author uses *effective thinking* as the collective term for these two types of behavior, others have preserved the term *critical thinking* when making a like synthesis.

From this point of view, the first component of critical thinking has to do with question-asking and hypothesis-formulating behaviors. Kurfman noted:

> When the focus is on individual students, the basic behavior to be identified is simply whether a student raises questions and suggests possible answers. The behaviors that distinguish more effective from less effective questions and hypotheses are less readily identifiable, primarily because their effectiveness depends on what follows. Does the question stimulate and clearly direct inquiry? Is a student able to support his hunch with plausible reasons so that its examination seems worth the effort? Does the hypothesis clearly direct the search for data?[15]

The second major component of critical thinking, when viewed in this way, has to do with the evaluation of the questions which have been raised and the answers which have been provided. Kurfman explained:

> The second major aspect of effective thinking is distinguishable from the creativity involved in raising questions and suggesting answers . . . Students are asked to test the soundness of their generalizations, explanations, and predictions. Involved here are such student behaviors as checking the reliability and adequacy of information, identifying unstated assumptions, and following logically valid lines of reasoning. It is with critical thinking skills that most success has been achieved thus far in distinguishing effective from ineffective student thinking. In order to apply these skills there are rules to be learned and applied. There are criteria for determining the reliability of sources and for judging the logical validity of an argument. Students are called effective thinkers in the critical-analytic sense when they demonstrate the ability to apply the relevant criteria in testing hypotheses.[16]

Although the author stressed the importance of the critical aspects of thinking at the point of hypothesis testing, he also considered such skills relevant at the question-asking and hypothesis-formulating stage.

A more complex pluralistic view of critical thinking has been provided by Eisner, who defined critical thinking in terms of four cognitive components or behaviors; i.e., questing, speculating, evaluating, and constructing. The first of these, questing, appears to contain both an affective and a cognitive element. Eisner explained:

> It is the conscious and deliberate pursuit of knowledge, exemplified by the student's independently initiated search for the problematic and his disposition towards wonder, that characterizes the first component of critical thought, questing.[17]

In this connection Eisner emphasized the natural bent for questing and the importance of fostering thoughtful questions, e.g. "How did the Crusaders determine their travel routes to the Holy Land?"[18]

There are students of high curiosity who excel in the asking of productive questions, but there are others who excel in the answering of questions in creative and imaginative ways. Such students as the latter may be characterized as strongly speculative.

> The inclination towards questing the problematic and the propensity towards wonder is frequently but not always followed by a second mode of behavior—one of speculation. Man possesses the wonderful capacity not only to obtain experience from his transaction with the outer world; he is also able to construct a psychological environment built upon the breezes of phantasy and imagination and removed from the conditions of the "real" world. This process can be looked upon as the ability to speculate, to formulate ideas and images of what might be. Speculation, as developed here, is conceived of as the ability to generate models or theories to explicate phenomena. Often these ideas are seen by the

> speculator as tentative, reasonable, and interesting guesses about why something is or is not the case.[19]

Thus, students strong on speculation are "model builders, makers of cosmologies, people who obtain great satisfaction in imaginatively constructing networks of ideas. . . ."[20] Involved here is what Eisner terms "creative intuition."[21]

Eisner's third component, evaluation, has to do with the appraisal of an idea according to the logic of its propositions, its supporting evidence, and its denotative and connotative meanings. In Eisner's words:

> A third component of critical thinking is that of evaluation. Evaluation has three major dimensions. First, an idea or body of ideas in any field is evaluated for the ***logic*** of its propositions. Receivers of information apply gross logical criteria to the statements they read or hear. These criteria act as the first test to determine whether the reader or listener will proceed any farther with the ideas he confronts. All of us, with varying degrees of sophistication, use logic as our initial screen for whatever a statement purports to be. It is meaningless if it is in logical error.
>
> A second type of criterion is concerned with evidence. For example, a historian reading a new work on the the origin of the Dead Sea scrolls not only tests it for the logic of its propositions, but also for the historical evidence that it employs in supporting them. . . .
>
> The third type of criterion that is applied in the evaluation of propositions is of a qualitative variety. The way in which language is organized, the types of words that are selected, the emphasis given to certain phrases, all contribute to the content and meaning of the message. . . . Paradigm cases of this third mode of evaluation may be found in the evaluation procedures of those responsible for interpreting the meaning of diplomatic communiques. But students, too, engage in this type of evaluation when they appraise the underlying meanings and biases of the material they read, the lectures they hear, and the contributions of their classmates.[22]

Such a view of the act of evaluating suggests that criteria for analysis be drawn from logic, from the evidential requirements of diverse fields, and from semantics.

Eisner's fourth and last cognitive component of critical thinking is constructing, a process that recognizes relationships between different events.

> Constructing, a fourth component of critical thinking, is the production of relationships or parallels between seemingly unrelated concepts. It is through the construction of these relationships that the individual is able to perceive elements as part of a larger whole and in their relationships and interaction with each other. For example, a student studying the economic structure of colonial America and the Protestant ethic may recognize no relationship between the two. . . . A student holding such a view of historical phenomena holds faulty notions about the historical period itself; in short, the conception that historical events exist in isolation provides a severely distorted picture of the past.[23]

This last component seems also to be a high-order characteristic involving the use of cues, flashes of insight, and creative theory building that seeks "to unify, to relate, and to explain what was previously viewed as separate, unrelated, and unaccounted for."[24] In this sense, constructing is similar to speculating in the development of useful theory.

In discussing four cognitive components of critical thinking, Eisner has attempted "to analyze a global concept into some constituent parts. In turn, this analysis may prove useful in formulating educational objectives and in constructing evaluation devices."[25] In Eisner's pluralistic view, one sees elements of problem solving, creative thinking, associative thinking, and critical thinking (as singly defined). Although Eisner's model provides few answers, it does raise numerous provocative questions.

III

Specific Skills Which Cluster Under the Critical Thinking Rubric

In the previous section, three basic views of the nature of critical thinking were posited. In this section, the meaning of critical thinking will be examined from a totally different vantage point. Having presented views of critical thinking from a theoretical posture, an attempt will now be made to present an operational view of the nature of critical thinking by examining the kinds of behaviors attributed to students who are said to be thinking critically.

Since numerous lists of critical thinking skills exist, the writers have had to choose a few from many alternatives. In making these choices, the writers have been guided by the belief that the products of long-term sustaining research and development projects are to be preferred to the products of short-term *ad hoc* projects. Thus, the lists which follow were abstracted from the documents of major long-range critical thinking projects. It is not claimed that these lists are representative but that they are the products of considered deliberation.

In the discussion which follows, operational definitions are presented under the headings of five major projects. In each case, the general nature and purpose of the project are described before specific student behaviors identified by the project are listed.

The Eight-Year Study of the Progressive Education Association

One of the first major study groups to consider student critical thinking abilities was the Commission on the Relation of School and College, an arm of the Progressive Education Association. Established in 1930, the Commission implemented the well known but subsequently well ignored Eight-Year Study during the academic years of 1933 to 1941.[26] Results reported in 1942 indicated the possibilities and importance of experimental curriculums in the high school to improve student critical thinking abilities both directly by means of specific teaching measures and indirectly as a result of departures from traditional curriculum approaches, i.e., change in content, organization, and procedure.

Reports of the Study are contained in the five-volume series on Adventures in American Education. Noticeable in the discussions across volumes is a lack of consistency in the use of terms, e.g. reflective thinking, critical thinking, clear thinking, problem solving. Whatever the term used, Hartung et al. in volume two "find considerable emphasis upon this objective [clear thinking] in the statements of purposes submitted to the Evaluation Staff by the schools participating in the Eight-Year Study."[27]

When it became necessary to measure the general objective of clear thinking, the Evaluation Staff embarked upon the development of measuring instruments by first clarifying elements of the objective and analyzing behaviors that would reveal student achievement in terms of the objective. From these steps a definition of clear thinking emerged:

> In the course of the analysis it was convenient to break up the general objective into a limited number of component parts, and then to analyze each of these in some detail. The aspects of clear or "critical" thinking which were selected dealt with the ability to *interpret data*, with the ability to *apply principles* of science, of the social studies, and of logical reasoning in general, and finally, with certain abilities associated with an understanding of the *nature of proof*....[28]

Thus, desirable student behaviors were reported under four basic headings: Interpretation of Data, Application of Principles of Science, Application of Principles of Logical Reasoning, and the Nature of Proof. In the treatment which follows, specific behavioral objectives are listed under each of these four

headings. Exigencies of space preclude the presentation of the rationale which accompanies each behavioral objective. For the sake of continuity the behavioral objectives are numbered consecutively across factors.

Interpretation of Data

After recognizing that interpretation may be viewed as a complex act involving the ability "to judge the accuracy and relevance of data, to perceive relationships in data, to recognize the limitations of data, and to formulate hypotheses on the basis of data,"[29] the committee selected two behaviors which seemed to them to be of paramount importance in the design of evaluation instruments:

1. the ability to perceive relationships in data (e.g., make comparisons, see common elements, recognize prevailing tendencies and trends)
2. the ability to recognize the limitations of data (e.g., recognize what may and may not be established by given data, recognize that few generalizations may be made without qualification)

Application of Principles of Science

The committee responsible for preparing objectives under this heading were operating under the assumption "that students should learn to apply knowledge obtained in the science classroom and laboratory to the solution of problems as they arise in daily living."[30] The behaviors involved in such an application were seen as twofold:

3. the ability to make a decision about the probable explanation or prediction relevant to a given situation.
4. the ability to justify through the use of science principles and sound reasoning the explanation or prediction made.

Based on this analysis, several test instruments were developed to evaluate the ability of students to apply principals drawn from the subject-matter areas of general science, chemistry, biology, and physics.

Application of Principles of Logical Reasoning

The committee responsible for preparing behavioral objectives under this heading expressed a belief that "students in secondary schools should acquire the ability and the disposition to apply principles of logical reasoning in dealing with their everyday experiences."[31] The specific behaviors chosen to characterize student progress toward the achievement of this objective are the following:

5. the disposition to examine the logical structure of arguments and to apply principles of logical reasoning in the study of arguments.
6. the ability to distinguish between conclusions which do and ones which do not follow logically from a given set of assumptions.
7. the ability to isolate the significant elements in the logical structure of an argument.
8. the ability to recognize the application of a logical principle . . . to explain why a conclusion follows logically from given assumptions.

No attempt was made to prepare objective measures of student disposition to apply logical principles. Rather, the efforts to measure behaviors were directed toward the abilities connected with applying logical principles.

The Nature of Proof

The committee responsible for preparing behavioral objectives under this heading recognized that "students in secondary schools [should] react to the proofs which they meet in their daily experiences."[32] Although some basic definitional problems related to such concepts as proofs, arguments, etc. were never happily resolved, the committee set forth behaviors which characterize progress toward this general objective:

9. the disposition to analyze proofs critically.
10. the ability to recognize the basic assumptions upon which a conclusion depends, and to see the logi-

cal relationships between these assumptions and the conclusion.

11. the recognition of the need for further data to confirm, qualify, or negate the available evidence.
12. the ability to distinguish between assumptions whose tenability could be checked by collecting further data and assumptions whose tenability could not be checked in this way.
13. the recognition of the possible ways for studying a problem further, and ability to distinguish between fruitful and unfruitful methods of further study.
14. the willingness to accept or reject assumptions tentatively, and to test the conclusions which follow from these assumptions by acting upon them.
15. the recognition that new evidence upon the soundness of one or more of the assumptions may make it desirable to reconsider the argument and perhaps to qualify the conclusion tentatively reached.

Given the initial lack of definition and the clutter apparent in this list of behaviors, it is not surprising that this committee found the tasks of measurement "extremely complex" and the products of their efforts "too complicated for practical purposes."

Although we have chosen to number the student behaviors identified sequentially, it should be apparent that these abilities are not mutually exclusive, nor were they perceived as such by members of the staff.

The Cooperative Study of Evaluation in General Education

In 1950 the American Council on Education initiated the Cooperative Study of Evaluation in General Education, with Paul L. Dressel as Director and Lewis B. Mayhew as Assistant Director. Aside from the overall general purpose stated in the study title, primary purposes of the study included "clarification and possible redefinition of the objectives of general education [and] development of more adequate and reliable means of measurement."[33] Committees were formed to explore objectives in the following six areas: social science, science, communications, humanities, attitudes (values and personal adjustment), and critical thinking. The last two areas are described as "pervasive objectives," whereas the other four areas are readily identifiable with subject-matter disciplines. An interesting outcome of the study is that all committees recognized the importance of critical thinking as evidenced by the design and development of tests for evaluation in each of the five areas other than critical thinking itself. Dressel and Mayhew stated that:

> As the Cooperative Study began, it was agreed that critical thinking was considered one of the important outcomes of general education with which the project would be concerned. As each of the six committees defined its sphere of interest, the objective of critical thinking began to assume greater proportions. Regardless of whether a committee labeled the trait "critical analysis and judgment" or "critical thinking" or "ability to read current science materials," the skills which seemed to be involved were all quite similar. Whether the similarity in conception of thought is attributable to some basic quality or whether it is merely attributable to the influence of Aristotle, Bacon, and Dewey in American schools remains a question. This common concern, however, served to emphasize the importance of critical thinking and suggested that critical thinking, viewed broadly, might provide the emphasis whereby general education courses, individually, could be better planned and taught, and whereby general education programs might achieve among the courses some larger degree of integration. We would suggest, therefore, that critical thinking might serve where other principles have failed, and we shall try to demonstrate the validity of this position.[34]

This conception implies that the goal of improving student critical thinking abilities may be a major integrating concept underlying the development of programs in general education rather than a peripheral objective more observed in the breach than in the practice of a traditional curriculum.

Although all six committees were interested in critical thinking abilities, only the behaviors identified by the Intercollege

Committee on Critical Thinking will be presented. However, it was noted by the directors of the project that "three other committees of the Study working independently produced lists which were essentially in one-to-one correspondence"[35] with that of the critical thinking committee. The specific abilities, organized in eight ability clusters, were printed under the heading "A Tentative List of the Problem-Solving Aspects of Critical Thinking."

1. Ability to recognize the existence of a problem
   a) To recognize related conditions in a situation.
   b) To recognize conflicts and issues in a situation.
   c) To locate "missing links" in a series of ideas or incidents.
   d) To recognize problems which have no solution.
2. Ability to define the problem
   a) To identify the nature of the problem.
   b) To understand what is involved and required in the problem.
   c) To recognize ways in which the problem can be phrased.
   d) To define difficult and abstract elements of the problem in simple, concrete, and familiar terms.
   e) To break complex elements of the problem into workable parts.
   f) To identify the central elements of the problem.
   g) To place the elements of the problem into an order in which they can be handled.
   h) To eliminate extraneous elements from the problem.
   i) To place the problem in its context.
3. Ability to select information pertinent to the solution of the problem
   a) To distinguish reliable and unreliable sources of information.
   b) To recognize bias upon which information is selected and rejected.
   c) To recognize information relevant to the solution of the problem.
   d) To select adequate and reliable samples of information.
   e) To systematize information.
   f) To select information from personal experience relevant to the solution of the problem.
4. Ability to recognize assumptions bearing on the problem
   a) To identify unstated assumptions.
   b) To identify unsupported assumptions.
   c) To identify irrelevant assumptions.
5. Ability to make relevant hypotheses
   a) To discover clues to the solution of the problem.
   b) To formulate various hypotheses on the basis of information and assumptions.
   c) To select the more promising hypotheses for first consideration.
   d) To check the consistency of the hypotheses with the information and assumptions.
   e) To make hypotheses concerning unknown and needed information.
6. Ability to draw conclusions validly from assumptions, hypotheses, and pertinent information
   a) To detect logical relationships among terms and propositions.
   b) To recognize necessary and sufficient conditions.
   c) To identify cause and effect relationships.
   d) To identify and state the conclusion.
7. Ability to judge the validity of the processes leading to the conclusion
   a) To distinguish validly drawn conclusions from others chosen, for example, because they are in accord with values, preferences, and biases.
   b) To distinguish a necessary inference from a probable one.
   c) To detect formal logical inconsistencies in the argument.
8. Ability to evaluate a conclusion in terms of its application
   a) To recognize conditions which would be necessary to verify a conclusion.
   b) To recognize conditions which would make a conclusion inapplicable.
   c) To judge the adequacy of a conclusion as a solution of the problem.[36]

This tentative list was later reduced to five general abilities which were printed under the heading "A Brief List of Critical Thinking Abilities":

1. The ability to define a problem.
2. The ability to select pertinent information for the solution of a problem.
3. The ability to recognize stated and unstated assumptions.
4. The ability to formulate and select relevant and promising hypotheses.
5. The ability to draw conclusions validly and to judge the validity of inferences.[37]

This reduction and revision is seen by the directors as evidence of the fallibility of the tentative list.[38]

In both of these lists, a strong concern for problem solving is in evidence. The directors of the study recognize this bias and justify it on the strength of the assertions that "problem solving is essential to effective living" and that "problem solving . . . [embraces] most of the aspects of critical thinking."[39]

The Illinois Project on Critical Thinking

One of the earliest large-scale studies concerned solely with the concept of critical thinking was the Illinois Project on Critical Thinking begun in the spring of 1954 as a project of the Illinois Curriculum Program Committee. The overall purpose of the study was "to work out effective teaching methods and instructional materials to improve student ability to think soundly, and to set forth those concepts and principles of logic, semantics, and scientific method involved in the assessment and control of reasoning."[40] The Project, based at the University of Illinois, was conducted with the cooperation of three Illinois high schools: Evanston Township High School, New Trier Township High School, and Niles Township High School.

Consistent with the overall purpose of the study was the specific definition assigned to critical thinking by the staff:

> Critical thinking consists in the ability to meet, in accordance with logical norms and established methods, the various demands upon judgment and reasoning that are encountered in the course and full range of experience.[41]

Among the tributes awarded this definition by its makers is that it is behavioral and specific: "To say that our definition is behavioral is to say that it directs observation to actual instances of behavior. We can observe what an individual does and says under a given set of circumstances."[42] These circumstances might include the kind of logical reasoning required, the kind of classification involved, whether a premise is missing, whether there is a question of definition or interpretation, and so on. If specific matters of reasoning are involved, then specific thinking abilities as evidenced by behaviors must be required. "Thus our definition of critical thinking includes a list of specific reasoning and judgmental abilities, and a list of understandings necessary to their development."[43]

A list of abilities and underlying principles in relation to grade level and understandings was developed by the staff. The listings were developed in the light of the following three questions:

> (1) What abilities, specifically, shall be selected as constituting critical thinking, and what principles and understandings are appropriate to the development of these abilities?
>
> (2) At what grade levels should these principles and understandings be introduced? And this is to ask: at what differing grade levels should we attempt to develop the various abilities?
>
> (3) In what subjects can the appropriate principles and understandings be taught in the course of developing the abilities?[44]

For the purposes of this paper, the list of student behaviors is abstracted from the total development. The sixteen abilities identified are:

1. Can tell when a term has been adequately defined.
2. Can identify certain common types of misuses of language.
3. Can distinguish between an argument and a description.
4. Can distinguish among questions of truth and validity.
5. Can recognize certain common types of errors in drawing conclusions about matters of fact.
6. Can decide whether an inductive conclusion is warranted in terms of the evidence.
7. Can identify a hypothesis.
8. Can tell whether a given state-

ment is a useful prediction from a hypothesis.
9. Can tell whether or not the variables in an experiment have been adequately controlled.
10. Can tell when a variable is relevant.
11. Can distinguish hypotheses which assert necessary conditions from hypotheses asserting sufficient conditions for the occurrence of an event.
12. Can evaluate the reliability of items of information.
13. Can tell whether or not a deductive argument is valid.
14. Can identify and evaluate different types of explanation and tell what type is appropriate to a given situation.
15. Can locate and identify assumptions.
16. Can recognize a value statement and decide when it is justified.[45]

Limitations of space and purpose have caused us to exclude the principles and understandings as they relate to grade levels and subjects.

The Cornell Project on Critical Thinking

Phase I, Deductive Reasoning in Adolescence, of the Cornell Project on Critical Thinking Readiness in Grades 1–12 began in May of 1962 with the overall goal of contributing to "what critical thinking is and to knowledge about when it can be taught."[46] Of six specific objectives listed, Objective 1 is the most pertinent one at this point: "To become more clear about the nature of deductive logic, as used in ordinary reasoning, and to compare this analysis of deductive logic with Piaget's to see whether we were talking about the same thing as he did."[47] The remaining objectives are concerned with testing, mastery of principles, and readiness among students aged 10–18. The main subject matter of this study is logic, defined as "that part of critical thinking which deals with whether a conclusion follows necessarily from the premises that are offered in support of it."[48]

In this preparatory program Ennis worked out an extended definition that includes a list of twelve aspects of critical thinking—factors equivalent to those referred to by other investigators as critical thinking abilities. The twelve aspects of critical thinking are as follows:

1. Grasping the meaning of a statement.
2. Judging whether there is ambiguity in a line of reasoning.
3. Judging whether certain statements contradict each other.
4. Judging whether a conclusion follows necessarily.
5. Judging whether a statement is specific enough.
6. Judging whether a statement is actually the application of a certain principle.
7. Judging whether an observation statement is reliable.
8. Judging whether an inductive conclusion is warranted.
9. Judging whether the problem has been identified.
10. Judging whether something is an assumption.
11. Judging whether a definition is adequate.
12. Judging whether a statement made by an alleged authority is acceptable.[49]

The Wisconsin Concepts in Verbal Argument Project

The Wisconsin project came into being in 1964 as one of the initial projects of the Wisconsin R & D Center. The particular focus of the project concerned concepts related to the evaluation of ordinary arguments. The various phases of the project included preparation of "A Taxonomy of Concepts and Critical Abilities Related to the Evaluation of Verbal Arguments . . .;"[50] the development of a battery of seven tests entitled, "Wisconsin Tests of Testimony and Reasoning Assessment . . . ,"[51] the establishment of norms for student critical thinking behaviors, and the development of a learning program for direct instruction in concepts related to verbal argument.[52]

Unlike the previous critical thinking projects which borrowed extensively from formal logics, the Wisconsin project is based on a set of concepts drawn from the thinking of a modern English logician named Stephen Toulmin.[53] The Toulmin system was elected in preference to traditional logics in the belief that the Toulmin model is more appropriate to the world of everyday arguments and is more suitable for high school minds. The terminology of the critical abilities identified in the taxonomic work partially reflects the specialized terminology of the Toulmin system.

The critical abilities initially posited by the project staff are the following:

1. The ability to distinguish between sentences functioning as statements and sentences functioning as performatives,
2. The ability to distinguish arguments from other forms of verbal discourse,
3. The ability to recognize components that are related in statements,
4. The ability to recognize types of claims in arguments,
5. The ability to recognize testimony offered in justification,
6. The ability to appraise testimony in terms of internal criteria (i.e., position to observe, competency to observe, lack of bias, qualification to judge),
7. The ability to appraise testimony in terms of external criteria (i.e., intrasource consistency, intersource consistency, recency, proximity),
8. The ability to recognize arguments developed through reasoning,
9. The ability to classify reasons by argumentative function,
10. The ability to detect arguments in which relational statements are suppressed,
11. The ability to recognize various patterns of reasoning,
12. The ability to supply appropriate warrants in relating data to claims,
13. The ability to appraise reasons according to relevant rules of inference,
14. The ability to recognize the degree of acceptability of a claim as determined by the various elements in an argument,
15. The ability to analyze the functions of statements in complexes of interrelated arguments,
16. The ability to detect dissuasions and diversions,
17. The ability to detect misuses of language.[54]

With this list we conclude the identification of specific skills which cluster under the critical thinking rubric. In the section which follows, relevant conclusions will be drawn.

IV

Conclusion

It has been the purpose of this paper to clarify the nature of critical thinking by examining and classifying previous attempts at direct definition and by positing lists of behavioral objectives. Having completed this review, relevant conclusions will be drawn.

The survey of literature reported in this paper discloses an astounding lack of consistency in very basic terminology. At various moments, critical thinking has been associated in whole or in part with problem solving, creative thinking, reflective thinking, logical thinking, reasoning, evaluation, associative thinking, and judgment. So dense is the semantic jungle in which these terms reside that some have sought out new terms less burdened by previous semantic confusion. Thus, Kurfman[55] adopted the term *effective thinking* and Smith and Tyler[56] chose *clear thinking* as different labels for essentially the same process. Others have expressed preference for *straight thinking*, *sound thinking*, and *rational thinking*.

Of greater significance than the lack of consistency in terminology is the inconsistency of basic views regarding the nature of the act. Even a cursory glance at sections II and III of this paper should reveal to the reader a striking inconsistency in basic notions regarding the nature of critical thinking. Russell's notion of critical thinking as a "process of evaluation or categorization in terms of some previously accepted standards"[57] and Ennis' notion of critical thinking as "the correct assessment of statements"[58] are hardly comparable to Aiken's notion of critical thinking as "...[originating] with the sensing of a problem... a quality of thought operating in an effort to solve the problem and to reach a tentative conclusion... a process of problem solving requiring the use of creative insight, intellectual honesty, and sound judgment... the basis of the method of scientific inquiry."[59] The inconsistency in basic postures is further evidenced by a comparison of the behavioral objectives outlined by the critical thinking committee of The Cooperative Study of Evaluation in General Education[60] with those set forth by the Cornell Project[61] or, even more strikingly, the Wisconsin Concepts in Verbal Argument Project.[62] Such disparate views suggest that people using the term *critical thinking* are looking at wholly different acts.

Not all views of critical thinking have been equally conducive to curriculum development and implementation. The view of critical thinking as problem solving has not led to the development of a clear-cut system of concepts which may be taught to students. To suggest that problem solving proceeds in a series of well ordered steps does not suggest the precise kinds of understandings that a child must have to perform to maximum capacity at each level. In addition, the research finding that the nature of the problem strongly influences success in problem solving[63] raises interesting questions about the orders of knowledge and sources of information one need have to solve problems gathered from a broad spectrum of subject-matter fields and life experiences.

Although one may applaud the attempt to set forth what one must know and do to be a sound, clear, logical, or rational thinker in all facets of human endeavor, the pluralistic view has not resulted in a unified, uncluttered model of the critical thinking act. For example, the early Eight-Year Study of the Progressive Education Association[64] lists behavioral objectives drawn from the sciences, logic, and problem-solving theory without managing a successful synthesis of the three. Although the thinking of Eisner[65] more closely approaches a unified model, it is not sufficiently detailed to provide the basis for instruction.

The view of critical thinking as a "process of evaluation... in terms of some previously accepted standards"[66] has provided the strongest conceptual basis for instruction of the three broad views of critical thinking. Thus, Smith and the Illinois Project developed "a list of specific reasoning and judgmental

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abilities and a list of understandings necessary to their development";[67] Ennis[68] in Phase I of the Cornell Project defined the conceptual basis for instruction and testing in terms of twelve principles of conditional logic and eight principles of class logic; and Allen, Feezel, and Kauffeld[69] of the Wisconsin Project identified twelve clusters of concepts associated with criteria used in evaluating arguments in the field of ordinary discourse.

Given the history of major critical thinking projects, it would seem reasonable to conclude that the evaluative view of critical thinking holds the greatest promise for instructional implementation. However, even within this view, these are great disparaties in approach. Since evaluation involves the assessment of statements against a set of standards, the particular standards selected vary from project to project. The standards most frequently employed are those borrowed from semantics (for concepts related to word uses and meanings), logic (for the norms of coherence and consistency), and empirical science (for the norms of inquiry and truth).

In choosing from among the various available standards, it would seem important that future critical thinking projects give strong initial attention to defining the special field in which the student is to be taught to think critically. In the past, critical thinking has been often viewed as a field-invariant phenomenon. Thus, Dressel noted:

> There are aspects of critical thinking which pervade all areas of knowledge. Respect for exact information and concern about its adequacy, recognition of explicit or implicit assumptions, detection of inconsistencies, creation of new ideas, and evaluation of the adequacy or validity of a conclusion or work are involved in communication, in science, in literature, and in the arts.[70]

When critical thinking is viewed in this way, the particular model elected must account for such diverse habits of thinking as those of the scientist, the historian, the logician, the literary critic, the lawyer, and the man on the street. That it is difficult for one model to prosper under such a burden would seem obvious. In having to accommodate diverse acts under a common heading, critical thinking is explained by a cluttered model which fits no field well.

Since it is difficult for a single set of critical thinking standards, or even a cluster of such standards, to define adequately what a person must do to be critical in all fields of human endeavor, it would seem wise to determine the particular field in which the student is to develop critical skills. A clue to the field which may be of primary interest to most secondary school teachers was provided by Russell when he observed:

> In a world where the child gets little help in evaluating the ideas in the comic strip, the movie "epic," the advertising "pitch," and the unspoken assumptions of the TV western, it seems important that school programs give help in developing critical thinking abilities.[71]

If most teachers subscribe to this view, and it is likely that they do, it would seem apparent that the field in which we wish students to think critically is the field of ordinary discourse. Which is to say, most secondary school teachers are not interested primarily in equipping students to think as logicians, historians, lawyers, literary critics, or scientists. Rather, most secondary school teachers will be satisfied if their students learn to think critically as ordinary people in the everyday world. Perhaps what is needed, then, is a model of critical thinking which explains a particular field—the field of ordinary discourse. Although such a model would be inappropriate to the physical and natural sciences, it would be appropriate to most of the other subject matter areas of the school curriculum. This distinction may be somewhat obscured by the common belief that the subjects of the high school curriculum consist of distinct fields of inquiry. However, in fact, the humanities, the social sciences, history, etc. are all geared to equipping the student to reason in the field of ordinary discourse.[72]

If it is our goal to prepare students to think critically about the kinds of assertions they encounter in the field of ordinary discourse, it would seem important that greater attention be given to defining that field. Having made such a definition, it would then seem appropriate to measure systems of critical thinking concepts against the demands of critical thinking in the everyday world. From this vantage point, one may discover that while the principles of class and conditional logics explain the rules of the logicians game, they do not describe the way that real people do or should process the everyday claims made on their beliefs.

Notes

To Chapter I

1. As quoted in Robert L. Ebel, "The Relation of Testing Programs to Educational Goals," ***The Impact and Improvement of School Testing Programs***, Sixty-Second Yearbook of the National Society for the Study of Education, Part II (Chicago: University of Chicago Press, 1963), pp. 40–41.

2. Norman E. Wallen *et al.*, "The Outcomes of Curriculum Modifications Designed to Foster Critical Thinking," ***The Journal of Educational Research***, LVI (July–August, 1963), 529.

3. Paul L. Dressel, "Critical Thinking: The Goal of Education," ***NEA Journal***, XLIV (October, 1955), 419.

To Chapter II

4. B. Othanel Smith *et al.*, unpublished manuscript received in 1965 from B. O. Smith, University of Illinois, Chapter I, p. 5.

5. David H. Russell, "Higher Mental Processes," Ed. Chester W. Harris, ***Encyclopedia of Educational Research*** (New York: The Macmillan Company, 1960), p. 651.

6. *Ibid.*

7. B. Othanel Smith, "The Improvement of Critical Thinking," ***Progressive Education***, XXXIX (March, 1953), 129.

8. Robert H. Ennis, "A Concept of ***Critical Thinking***: A Proposed Basis for Research in the Teaching and Evaluation of Critical Thinking Ability," ***Harvard Educational Review***, XXXII (Winter, 1962), 83.

9. George H. Hyram, "An Experiment in Developing Critical Thinking in Children," ***Journal of Experimental Education***, XXXVI (December, 1957), 125.

10. Ennis, *op. cit.*, pp. 81–111.

11. Rubin Gotesky, "The Lecture and Critical Thinking," ***Education Forum***, XXX (January, 1966), 180.

12. Karl O. Budmen, "What do *you* think, teacher?" ***Peabody Journal of Education***, XLV (July, 1967), 3.

13. Bernice Goldmark, "Critical Thinking: Deliberate Method," ***Social Education***, XXX (May, 1966), 329, 334.

14. Dana Kurfman, "The Evaluation of Effective Thinking," eds. Jean Fair and Fannie R. Shaftel, ***Effective Thinking in the Social Studies***, Thirty-Seventh Yearbook of the National Council for the Social Studies (Washington: National Education Association, 1967), p. 235.

15. *Ibid.*, p. 236.

16. *Ibid.*, p. 237

17. Elliot W. Eisner, "Critical Thinking: Some Cognitive Components," ***Teachers College Record***, LXVI (April, 1965), 628.

18. *Ibid.*

19. *Ibid.*, p. 629.

20. *Ibid.*, p. 629.

21. *Ibid.*, p. 630.

22. *Ibid.*, p. 632.

23. *Ibid.*, p. 632.

24. *Ibid.*, p. 633.

25. *Ibid.*, p. 634.

To Chapter III

26. The onset of World War II has been suggested as one reason that the results were largely ignored. Personal communication from John W. M. Rothney who served on four subcommittees of the Committee on Evaluation and Recording, April, 1968.

27. Maurice L. Hartung, Leah Weisman, Harold G. McMullen, and Harold C. Trimble, "Aspects of Thinking," eds. E. R. Smith and R. W. Tyler, ***Appraising and Recording Student Progress***, Vol. III: ***Adventures in American Education*** (New York: Harper & Brothers, 1942), p. 35.

28. *Ibid.*, p. 36.

29. *Ibid.*, p. 38.

30. *Ibid.*, p. 77.

31. *Ibid.*, p. 113.

32. *Ibid.*, p. 126.

33. Paul L. Dressel and Lewis B. Mayhew, ***General Education: Explorations in Evaluation***

(Washington: American Council on Education, 1954), p. 19.

34. *Ibid.*, pp. 272–273.
35. *Ibid.*, p. 179.
36. *Ibid.*, pp. 177–178.
37. *Ibid.*, pp. 179–181.
38. *Ibid.*, p. 179.
39. *Ibid.*, p. 177.
40. B. Othanel Smith *et al.*, unpublished manuscript, *loc. cit.*
41. *Ibid.*, Chapter II, p. 7.
42. *Ibid.*, Chapter II, pp. 7–8.
43. *Ibid.*, Chapter II, p. 8.
44. *Ibid.*, Chapter III, p. 1.
45. *Ibid.*, Chapter III, pp. 1–46.
46. Robert H. Ennis, ***Critical Thinking Readiness in Grades 1–12: Phase I. Deductive Reasoning in Adolescence***, Project No. 1680 (School of Education, Cornell University, May 15, 1962 to September 15, 1964), p. 1.
47. *Ibid.*, p. 77.
48. *Ibid.*, p. 2.
49. *Ibid.*, p. 84.
50. Ronald R. Allen, Jerry D. Feezel, and Fred J. Kauffeld, ***A Taxonomy of Concepts and Critical Abilities Related to the Evaluation of Verbal Arguments*** (Occasional Paper of the Wisconsin Research and Development Center for Cognitive Learning, No. 9; Madison: University of Wisconsin 1967).
51. R. R. Allen, Jerry D. Feezel, and Fred J. Kauffeld, ***Wisconsin Tests of Testimony and Reasoning Assessment (WISTTRA)*** (Practical Paper of the Wisconsin Research and Development Center for Cognitive Learning, No. 6; Madison: University of Wisconsin, 1969).
52. R. R. Allen, Fred J. Kauffeld, and William R. O'Brien, ***A Semiprogrammed Introduction to Verbal Argument***, Part One: ***Argument in Perspective***, Part Two: ***Argument Through Testimony***, Part Three: ***Argument Through Reasoning I***, Part Four: ***Argument Through Reasoning II*** (Madison: R & D Center for Cognitive Learning, University of Wisconsin, 1968).
53. Stephen Toulmin, ***The Uses of Argument*** (Cambridge: Cambridge University Press, 1958).
54. Allen *et al.*, ***Taxonomy***, *op. cit.*

To Chapter IV

55. Kurfman, *op. cit.*
56. E. R. Smith and R. W. Tyler, ***Appraising and Recording Student Progress***, Vol. III: ***Adventures in American Education*** (New York: Harper & Brothers, 1942).
57. Russell, *op. cit.*
58. Ennis, *op. cit.*
59. Wilford M. Aiken, ***The Story of the Eight-Year Study***, Vol. I: ***Adventures in American Education*** (New York: Harper and Brothers, 1942), p. 82.
60. Dressel and Mayhew, *op. cit.*
61. Ennis, *op. cit.*
62. Allen *et al.*, ***Taxonomy***, *op. cit.*
63. Russell, *op. cit.*
64. Hartung *et al.*, *op. cit.*
65. Eisner, *op. cit.*
66. Russell, *op. cit.*
67. B. Othanel Smith, *op. cit.*
68. Ennis, *op. cit.*
69. Allen *et al.*, ***Taxonomy***, *op. cit.*
70. Dressel, *op. cit.*, p. 419.
71. Russell, *op. cit.*, p. 652.
72. Although there are fields of inquiry which correspond to school subject disciplines (e.g., the field of historical inquiry is reflected in history courses), it should be clear that most subjects in the public schools are content to prepare students to function in the field of ordinary discourse.

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